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UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
COAL MINE SAFETY AND HEALTH

REPORT OF INVESTIGATION

Underground Coal Mine
Fatal Machinery Accident
November 12, 2007
San Juan Mine 1
San Juan Coal Company
San Juan County, New Mexico
ID No. 29-02170

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OVERVIEW

On Monday, November 12, 2007, at approximately 4:39 p.m. Edison Hatathli, age 50, was seriously injured while working as part of a set-up crew in the East Mains working section. Hatathli succumbed to his injuries on December 4, 2007. The accident occurred while the belt feeder or feeder breaker was being re-positioned on the East Mains No. 2 belt conveyor tailpiece with the belt running. Hatathli was located along the off-walkway side of the belt conveyor tailpiece between the coal rib and the tailpiece. He installed wood on the mine floor to construct a ramp for the tracks on the feeder breaker to climb and then helped guide the feeder breaker over the tailpiece. After several attempts, the feeder breaker contacted the guarding on the tailpiece as it was being backed away from the tailpiece. At that time, a loud "pop" was heard and two anchor bolts on the tailpiece broke causing the tailpiece to shift toward Hatathli. Within seconds, the remaining four anchor bolts pulled out of the mine floor and the tailpiece and belt conveyor recoiled outby approximately 73 feet. Hatathli was struck and injured by the tailpiece as it moved down the entry.

Management allowed the work practice of installing the feeder breaker at the tailpiece with the belt conveyor running and did not properly design the anchorage for the tailpiece, which caused the accident to occur. Eccentric (cantilever-type) loading on the anchor bolts caused them to fail from flexural bending. The bending occurred because an eccentricity (finite distance) existed between the location where the bolt was being pulled by the turnbuckle and the location where the ground and grout were supporting the bolt. Soft or loose ground near the surface did not provide adequate lateral support to the bolts. While the bolts were likely already overstressed prior to moving the feeder breaker from atop the tailpiece guarding, it is believed that the activity of tramming the feeder breaker off the tailpiece triggered the anchor bolt failures. A metallurgical evaluation by Matco Associates, Inc., determined that the bolt failures were likely the result of a bending overload, rather than hydrogen stress cracking (HSC). Contributing factors included a lack of task training on the safe work procedures for setting the feeder breaker and not maintaining the feeder breaker in safe operating condition.

GENERAL INFORMATION

The San Juan Mine 1, owned and operated by San Juan Coal Company (BHP Billiton), is an underground bituminous coal mine located at Waterflow, San Juan County, New Mexico, approximately 15 miles west of Farmington, New Mexico. The principal officers for San Juan Coal Company and the San Juan Mine 1 at the time of the accident were James Scott Jones, Operations Manager; David Hales, Health & Safety Superintendent; and Steve Bessinger, Engineering Manager.

The San Juan Mine 1 is accessed via portals located in the highwall of an abandoned surface mine pit. Coal is supplied to the local San Juan Generating Station. This mine

operates one longwall and three continuous mining machine development sections. The mine liberates approximately 3,500,000 cubic feet of methane daily.

The mine produces coal seven days a week on three ten-hour shifts: 10:00 p.m. to 8:00 a.m.; 7:00 a.m. to 5:00 p.m.; and 4:00 p.m. to 2:00 a.m. The mine employs 468 miners with 299 working underground, 120 on the surface, 13 in the preparation plant, and 36 in the office. The mine produced 6,898,040 tons of coal in 2007.

Prior to the accident, the last Mine Safety and Health Administration (MSHA) regular inspection was completed on September 27, 2007. The non-fatal days lost (NFDL) incidence rate for the mine in 2007 was 1.94. The National incidence rate for underground coal mines for the same period was 4.73.

DESCRIPTION OF ACCIDENT

On November 12, 2007, Edison Hatathli, B-shift set-up crew member, started the shift at 7:00 a.m. During the shift, he performed set-up work in the East Mains development section. At approximately 4:00 p.m., Jason Magelson, B-shift set-up crew foreman, instructed Terrill Lee, B-shift set-up crew member, to re-position the feeder breaker on the East Mains No. 2 belt conveyor tailpiece. Magelson also told Hatathli and Jacob Whitlock, B-shift set-up crew member, to assist Lee. Hatathli and Whitlock had been roof bolting in the East Mains section at the time. On the afternoon shift on Sunday, November 11, 2007, a coal car struck the feeder breaker hard enough to damage both the feeder breaker and the belt conveyor tailpiece. The feeder breaker was trammed off the tailpiece to make repairs. The damaged guarding at the tailpiece was pulled away from the tail roller and the anchor bolts for the tailpiece were checked and appeared to be undamaged. Maintenance work was also conducted on the damaged feeder breaker to repair the emergency stop cable and tram controls on dayshift, November 12, 2007. These repairs were finished and the feeder breaker was turned over to the set-up crew to position it over the tailpiece at approximately 3:30 p.m., November 12, 2007.

During the positioning of the feeder breaker, Lee operated the feeder breaker controls. Whitlock and James Chase, B-shift set-up crew member, were located along the walkway side of the belt conveyor tailpiece. Hatathli was located along the off-walkway side of the belt conveyor tailpiece. To re-position the feeder breaker, wooden planks were placed on the mine floor to build a ramp to elevate the feeder breaker discharge over the tailpiece. Hatathli installed the wooden planks on the off-walkway side of the feeder breaker and helped guide the feeder breaker onto the planks. Lee trammed the feeder breaker onto the wooden planks several times, but had to back off to install more planks to raise the feeder breaker higher to clear the tailpiece. During this work, the East Mains No. 2 belt conveyor continued to operate. Hatathli stayed on the off-walkway side of the belt conveyor and positioned himself outby the tailpiece while the feeder breaker was being trammed. On the last attempt, the end of the feeder breaker cleared the guarding on the tail roller of the tailpiece, but Lee could see that it

would not completely clear to allow proper alignment. He started to back out the feeder breaker again, but the tracks dug into the planks and mine floor, allowing the feeder breaker to drop slightly and contact the guard on the tailpiece. At that time, a loud "pop" was heard and the inby end of the tailpiece shifted toward the rib where Hatathli was positioned. Two of the anchor bolts on the off-walkway side of the tailpiece were later found to have broken. Chase attempted to shut down the belt conveyor with the emergency stop cord, but was unable to do this before the tailpiece broke free. Within seconds, the belt overlapped itself, jamming the tailpiece and causing an upward lift, which pulled the remaining four anchor bolts out of the mine floor. When this occurred, the tailpiece and belt conveyor recoiled outby in the belt entry approximately 73 feet. Hatathli was struck in the back by the tailpiece as it moved down the entry.

Lee went immediately to call for help and requested an EMT to come to the scene. Hatathli was found approximately 60 feet outby the original location of the tailpiece. He was conscious and able to talk to the crew. Hatathli was stabilized, taken out of the mine and transported to the hospital where he died of his injuries on December 4, 2007.

INVESTIGATION OF THE ACCIDENT

The MSHA Call Center was notified of the accident at approximately 5:09 p.m., November 12, 2007. Cord Cristando, Supervisory Mine Safety and Health Inspector, Aztec, New Mexico Field Office, was dispatched to the mine and issued a Section 103(k) order on November, 12, 2007, to ensure the safety of persons at the mine until an investigation could be conducted and the affected area deemed safe. Cristando conducted a preliminary investigation. An investigation team was not assembled at that time as the accident had not resulted in a fatality and it was thought that Hatathli would recover from his injuries. After Hatathli's death on December 4, 2007, a formal accident investigation team was assembled. The MSHA accident investigation team arrived at the mine on December 11, 2007, and began the investigation (refer to Appendix A for a list of persons participating in the investigation). The accident scene was examined, measurements were taken, documents were obtained, and witness interviews were conducted. The investigation at the mine site concluded on December 13, 2007.

DISCUSSION

Location – The East Mains No. 2 belt conveyor was manufactured by Continental Conveyor and Equipment Company. The belt was 72 inches wide. Its tailpiece was located at crosscut 87-1/2 in Entry No. 4. The tailpiece was installed on September 11 to 13, 2007. As the tailpiece was not installed in a crosscut, there was minimal clearance on the left side of the belt tailpiece and feeder (as viewed looking inby). The right side, which had adequate clearance between the coal rib and the beltline, was termed the walkway side. The mine entry was 20 feet 3 inches wide and 9 feet 10 inches high. A 60

inch belt from the longwall gate road discharged onto the East Mains No. 2 belt conveyor at crosscut 65. The East Mains No. 2 belt conveyor was running at the time of the accident.

Feeder Breaker - The belt feeder breaker was manufactured by the Stamler Corporation. It was a model BF-14B-2-5C. It was 30 feet 9 inches long and 12 feet 6 inches wide. It could be trammed with two crawlers and the discharge end could be raised to provide clearance over a conveyor tailpiece. The discharge end of the feeder could be elevated to a maximum ground clearance of 3 feet 4 inches. The discharge end was supported by two 9 inch high beams.

Due to the minimal clearance between the feeder beams and the tailpiece, there had been several instances when the feeder had been pushed into the tailpiece as a result of shuttle cars impacting the feeder when they were dumping coal onto the feeder. Walter Burkett, a set-up foreman, indicated that three or four days prior to the accident, the feeder hit the tailpiece, causing it to displace 4 inches in the off-walkway direction. Reportedly, one of the turnbuckles became unhooked. The most recent instance of an impact was the night before the accident. At that time, the emergency stop cable had been damaged and the tailpiece guarding had been pushed into the belt. Also, just prior to re-positioning the feeder, the maintenance crew had been working on the tramming function of the feeder. Reportedly, the right crawler of the feeder was not tramming properly. It could be trammed in the outby direction without problems, but not in the inby direction.

Tailpiece Frame and Guarding – The structural frame for the tailpiece unit was 9 feet 1 inch wide and 10 feet 2 inches long. The frame supported the 29 inch diameter tail roller. It rested on two skids, one on each side of the belt. The skids were I-shaped steel members having an upward angle at the ends, so that the unit could slide along the ground. The structural frame and roller weighed 5.85 tons. The roller was protected by a frame of 3 inch by 3 inch by ½ inch supports angled to cover the roller. An expanded metal grating spanned across the frame to prevent individuals from contacting the moving roller. The distance from the top of the guarding to the base of the skid frame was 3 feet 10 inches. After the accident, one post of the frame roller was found to have a 2.25 inch tear and the frame was bent by prior impacts and damage during the accident.

Tailpiece Anchorage - The tension in the conveyor belt was provided by an automatic winch. The belt tension was transmitted to the head and tail pulleys. The tension at the tail pulley was counteracted by the anchorage of the structure. Originally, the tailpiece was anchored near each corner with a turnbuckle and anchor bolt, washer plate, and a nut. The anchor bolts were reportedly 7/8 inch diameter 5 foot-long Dwidag No. 7 bars that where grouted into the mine floor with Anchortite, a polyester resin distributed by Minova, USA. The grout holes were approximately 1.375 to 1.5 inch diameter. The manufacturer's literature indicates that when properly installed, the grout has a

compressive strength of 15,000 pounds per square inch (psi) and a tensile strength of 2,000 psi after seven days of curing.

The bolts were installed into the floor such that they were angled away from the direction of belt tension to increase their pullout resistance. Reportedly, one additional bolt was added on each side to the rear anchor point because shortly after the belt was put into service, a clevis was found to be spread open and the tailpiece had moved. The two additional bolts were 6 foot 6 inch-long Dwidag No. 7 bars. The original four turnbuckles were installed at an angle to the sides of the tailpiece. The two additional turnbuckles were installed more inline with the direction of the belt length. See Appendix D for a sketch of the tailpiece and anchor bolt locations.

The plates used as washers were 8 inch by 8 inch by 1/4 inch embossed steel bearing plates, typically used for roof support. The washers were held in place with 1-5/8 inch spherical nuts.

Failure Sequence – At 4:39 p.m. on November 12, 2007, the two off-walkway-side bolts (one inby and one outby) failed first making a loud pop noise. Once the two bolts ruptured, the remaining four anchor bolts pulled from the ground. The first bolt to pull from the ground was likely the long off-walkway-side inby bolt. As the anchorage was failing the tailpiece was skewing and the belting was training toward the off-walkway side. According to witness reports and the direction of travel of the tailpiece, it is believed that the next bolts to be pulled from the ground were the two inby walkway side bolts, then finally the outby walkway-side bolt. The final pullout released the tension in the belt allowing it to slide into the rib and down the entry, overtaking and impacting the fleeing victim. After the accident the belt was found to have folded over toward the off-walkway side. See Appendix D for a sketch of the tailpiece, anchorage, and failed anchor bolt locations.

Failed Anchorage – When the accident occurred, two of the six bolts that anchored the tailpiece fractured and the other four were pulled out of the mine floor. The two severed bolts were not available for inspection at the time of the on-site investigation. Both bolts had been sent to METCORR, a metallurgy and corrosion consultant prior to beginning the fatality investigation. All four of the remaining bolts were severely bent when they were pulled out. There was very little corrosion on these four bolts, with only minimal surface discoloration. The two bolts that severed were from the four originally installed. Both failed bolts were from the off-walkway side of the conveyor. Reportedly, they failed just below the ground level.

Once the two bolts severed, the four remaining bolts were pulled from the mine floor. Of the four remaining bolts, the grout encompassing the bolts was mostly intact on two of them. On the other two bolts, the grout was spalled from at least 50 percent of the bolt length. All four of the bolts that pulled out had two distinct curvature characteristics. Specifically, at the top of all four bolts, there was a near 90-degree bend

in each bolt. Then in the segment below the bend, there was a long, gradual curve in the bolt. The 90-degree bend appears to have occurred at or near the interface of the mine floor; that is, the sharp bend occurred where the bolt was protruding from the mine floor. The gradual bend would have occurred as the bolt was being pulled out of the mine floor.

The anchors were 7/8 inch diameter Dwidag No. 7 bars and all four bars still had an attached bearing plate and spherical nut:

> Inby walkway-side long anchor bolt - The total length of the bar was 76.5 inches. The residual 1.375 inch-diameter grout column still attached to the bar was 51 inches long. The distance from the end of the bolt to the sharp bend in the bar was 11.75 inches.
>
> Inby walkway-side short anchor bolt – The total length of the bolt was 60 inches. The residual 1.375 inch to 1.5 inch-diameter grout column was approximately 20 inches long. The distance from the end of the bolt to the sharp bend was 7 inches.
>
> Outby walkway-side short anchor bolt – The total length of the bolt was 60 inches. The residual 1.5 inch-diameter grout column was approximately 7.5 inches long. The distance from the end of the bolt to the sharp bend was 4.5 inches.
>
> Inby off-walkway-side long anchor bolt – The total bolt length was 75.5 inches. The residual 1.375 inch-diameter grout length was completely intact and measured 57 inches. The distance from the end of the bolt to the sharp bend was 17 inches.

Turnbuckles - The turnbuckles were either hook and hook or jaw and jaw type. Two recovered were the hook and hook type and they had measured distances between the inside of the eyes of 30.375 inches and 28.125 inches. The one jaw and jaw turnbuckle had a measured inside distance of 42.5 inches between the two pins. It was a 7/8 inch diameter pin. The three other turnbuckles could not be located by the company and therefore they were not available at the time of the investigation.

The turnbuckles were attached to a shackle that was in turn attached to shackles connected to each of the four lugs located on the sides of the tailpiece. Specifically, there were two lugs on each side of the tailpiece - one near the front (outby end) and one at the rear below the roller. Each lug was an approximately 8-inch by 8-inch plate, 1.25 inches thick, with a 2.125-inch diameter hole drilled through it for attachment of the anchorage hardware. Between the front and rear lugs, the horizontal distance was 71.5 inches. The vertical distance between the lugs and the centerline of the tail roller

was 17.75 inches and the distance between the lugs and the mine floor was 5.6 inches, which was the height of the framing (skids) located under the tail unit.

If not adjusted properly, the turnbuckles can place more load on one anchorage point than an adjacent anchorage point.

Continental Conveyor, the manufacturer, has calculated that the conveyor tailpiece anchorage must resist a running belt tension force of 14,515 pounds.

Mine Floor – The mine floor at the location of the tailpiece was reported to be wet with some standing water behind the tailpiece and on the walkway side. At the time of the fatality investigation, the tailpiece had been reinstalled further outby and the floor at the old location of the tailpiece had been compacted and disturbed by scoops operating in the area. Although the floor was moist there was no standing water. Multiple witnesses reported that the feeder breaker was sinking into the mud as they trammed it just prior to the accident.

From February 11 to February 13, 2008, the mine floor was cored and classified by Agapito Associates, Inc., a contractor to BHP Billiton. Four holes were drilled in the East Mains at the approximate location of crosscut 87-1/2. The borings were advanced to depths varying from 9 to 20 feet beneath the floor elevation. In three of the borings taken from the middle of the entry, the floor categorization for the top 3 feet of ground was loose road fill. It was underlain by 0.75 to 1.1 feet of mudstone.

It is unknown how thick the road fill was at the time of the accident. In the fourth boring that was advanced near the coal pillar, there was no road fill. The first 3 feet consisted of mudstone, carbonaceous shale and silt. At a depth of 3 feet, a 2-foot thick layer of sandstone was encountered. In two of the three core holes taken in the middle of the entry, a 2- to 3-foot thick layer of sandstone wasn't encountered until a depth of 4 to 6 feet below the mine floor.

METCORR - Metallurgical Examination – At the direction of the mine operator, a metallurgical examination of the two severed bolts was conducted by Dr. Bruce Craig, P.E. of METCORR, a metallurgy and corrosion consulting firm. Hardness testing of the bolts indicated they had a tensile strength of 121,000 psi.

According to Dr. Craig's report, the two bolts did not display any signs of necking (thinning of the bolt cross-section) or plastic deformation, nor was there pitting, corrosion, or surface damage on the bolts. There were no beach markings (clam shell-like markings indicating progressive crack growth) on the fracture surfaces; therefore, the failure was not attributed to repetitive loading (fatigue). In addition, there were no obvious defects at the fracture origins in either sample to indicate a pre-existing flaw that could have led to a brittle fracture.

Both fracture surfaces had some features typical of ductile overload (ability to stretch and yield), such as dimples, and some fine ridges typical of tearing. The metallurgist stated that it is more typical of a tearing topography surface. The fracture surface was a single crack, rather than a branched crack with secondary cracks, which would have indicated stress corrosion cracking[1](SCC). Therefore, SCC was ruled out as a possible failure cause.

The metallurgical report concluded that hydrogen stress cracking (HSC) was the failure mechanism. The tension at the tail pulley is counteracted by the anchorage of the structure. As a result, the anchor bolts were in a constant state of stress from the turnbuckles. With HSC, hydrogen enters the bolt from the environment and accumulates until a critical concentration is reached. At that point a crack forms and propagates outside the hydrogen-rich zone then stops until sufficient hydrogen accumulates to cause the crack to move further.

The hydrogen exposure was believed to have been from the hydrogen sulfide (H_2S) that is produced by the sulfate reducing bacteria found in the acid mine water. The environment at the tail pulley was reported to be wet from mine water accumulation. It was hypothesized by METCORR that the hydrogen entered into the bolts during the two-month period after installation until a critical concentration was reached. At that time, a crack initiated and propagated across a thumbnail portion of the bolt, at which point there was an abrupt failure.

Corrosive Bacteria - As early as 2000 and 2001, the mine had found evidence of a bacterial microbe that eats the sulfates prevalent in mine water and then emits hydrogen sulfide. Four near-surface samples taken in proximity to the site of the tailpiece by the operator tested positive for the sulfate reducing bacteria (SRB).

Matco Associates, Inc. - Metallurgical Examination – MSHA contracted with Matco Associates, Inc. (Matco) in Pittsburgh, Pennsylvania to independently examine the failed bolts, determine the tensile strength of the metal, and review METCORR's findings. Matco conducted 500 gram Knoop hardness testing and found the approximate tensile strength for the bolts to be 114,000 psi. Matco refuted the findings of METCORR regarding the appearance of the fracture surfaces and the references used to reach their conclusions. Matco did not find any direct evidence of a hydrogen source. They stated that since there was no direct evidence of an SRB related corrosion problem, then other factors such as tensile overloading, bending, and impact loading should have been considered.

On the fracture surface, Matco found that a shear lip was present at the fracture initiation location, which was evidence of tensile overload, bending, or a decarburized (removal of carbon) surface condition. Matco stated that there was no "cup and cone"

[1] Stress corrosion cracking is a failure mechanism that is caused by a corrosive environment and tensile stress.

fracture surface, so it was not pure axial overload (stretching the bolt to the point of failure). The fracture surface matched that of a bending overload fracture surface as found in the 9th edition of the ASM Metals Handbook, Volume 12, Fractography. Based on the method of anchorage, they conclude that the bolts likely failed from bending overload.

Bolt Loading – The tensile force in each turnbuckle is transmitted to its corresponding anchor bolt. The tensile force is limited by the rated capacity of the 7/8 inch diameter turnbuckle (20,000 pounds for the hook and hook model and 36,000 pounds for the jaw and jaw model). Even if the turnbuckle were to carry 36,000 pounds, the shear stress (45,600 psi) on the bolt should not have been enough to cause a shear failure. In addition, the metallurgical evaluation did not show elongation of the micro-structure[2], which would be expected from a shear failure. However, it was found that only a small eccentricity (finite distance) needed to be present for a cantilevered failure of the bar. The eccentricity would have been present if a vertical distance existed between the location of the turnbuckle hook, jaw, or shackle on the rod and the location where the rod is receiving adequate support from the ground and grout column. A small eccentricity causes a bending moment high enough to cause a flexural (bending) failure. For example, with an eccentricity of 1.5 inch, a load of 5,000 pounds in the turnbuckle would cause a moment large enough to fracture the anchor bolts.

Aside from high placement of the turnbuckle jaw, hook, or shackle on the rod, lack of adequate ground support from loosened ground or wet, soft ground (which was present) would also have been a reason for an eccentricity to exist between the load and support point. An analysis of the Anchortite grout sleeve surrounding the anchor bolts indicates that the bending loads would be high enough to rupture the sleeve if the ground is soft or loose near the surface. For example, with an eccentricity of 1.5 inch, a load of only 600 pounds in the turnbuckle would crack the grout sleeve. Once the grout sleeve cracks, the cross-section to resist bending is significantly reduced.

Prying Effect from Turnbuckle – Prior to the two bolts failing, it was not clear if the angle of the turnbuckles would have caused an impingement on the oversized bearing plate, thereby causing it to lever against the front side of the nut and backside of the bolt in a "can opener-type" fashion. This type of action could cause a localized bending effect on the bolt; however, the evidence was not conclusive that this caused the two original bolts to fail. The presence of the sharp bends at the top of the four bolts that pulled from the ground, however, indicates that localized stresses existed at the connection location as a result of the lever effect on the bolts as they were being extracted from the ground.

Impact Loading Applied to the Tailpiece Anchorage – At the time of the accident, part of the feeder breaker was stuck on the guarding of the tailpiece. Witnesses reported that the feeder was being moved off of the tailpiece when the anchor bolts failed.

[2] The structure of an object as revealed through microscopic examination.

However, it was reported that as the feeder was being trammed inby, the tracks were spinning, but the feeder was not moving well. The tracks were moving and crushing the cribs, and as a result, the machine was dropping and impinging on the guarding. The feeder and crib blocks were sinking into the mud as the crew was attempting to tram the tailpiece. Chase reported that the gearbox cover from the feeder on the off-walkway side had caught on the tailpiece guarding. Moving the feeder off and away from the tailpiece guarding should have reduced the loads on the tailpiece. However, at the moment the two separated there would have been a jarring or a sudden re-application of the loading to the anchor bolts.

Scrape Gouge on Off-Walkway-Side Coal Rib - A gouge 18 inches above the mine floor in the off-walkway-side coal rib was found outby the location of the tailpiece. The gouge occurred when the tailpiece struck the rib as it was being pulled outby by the released tension in the belt.

Beltline Safe Work Procedures – The operator had established safe work procedures for cleaning and maintaining beltlines, dated June 2003. This document was entitled "Cleaning & Maintenance of Beltlines – Underground, V-02, 6/03". These procedures included, "Do not work on belts unless shut off and locked and tagged out" and "When working on a head drive or tail piece lock out the belts on both sides of the work site."

Training and Experience - Hatathli, age 50, had 6 years 14 weeks of mining experience. He spent this entire period as a member of the set-up crew at the San Juan Mine 1. The responsibilities of the set-up crew are numerous, and Hatathli had received training commensurate with these duties. However, no record of task training, MSHA Form 5000-23, showed that Hatathli was ever trained on how and when to shut down and lock out belt conveyors including instruction in the health and safety aspects and the safe operating procedures related to his assigned tasks while re-positioning feeder breakers. It was not uncommon for members of his crew to re-position the feeder breaker in the performance of their assignments. Additionally, he was certified by the state of New Mexico as a Mine Examiner in August, 2006.

ROOT CAUSE ANALYSIS

An analysis was conducted to identify the most basic causes of the accident that were correctable through reasonable management controls. The following root causes were identified:

1. *Root Cause:* Management did not ensure that established safe work procedures (Cleaning & Maintenance of Beltlines – Underground, V-02, 6/03) to protect miners from hazards related to working around beltlines were followed when resetting the feeder breaker at the tailpiece.

from hazards related to working around beltlines were followed when resetting the feeder breaker at the tailpiece.

Corrective Action: The operator implemented a new written safe operating procedure for positioning feeder breakers and tasked trained the affected miners.

2. *Root Cause:* Management did not properly design the anchorage of the tailpiece.

   Corrective Action: The operator should engineer an anchorage system to safely resist the loads acting on the tailpiece.

3. *Root Cause:* Management failed to train the B-shift set-up crew in written safe work procedures established by the mine in June, 2003, when working on a conveyor belt tailpiece.

   Corrective Action: The operator implemented a new written safe operating procedure that explains the proper procedure for shutting down and locking out belt conveyors. The operator trained all affected miners in this standard operating procedure.

CONCLUSION

Management allowed the work practice of installing the feeder breaker at the tailpiece with the belt conveyor running and did not properly design the anchorage for the tailpiece, which caused the accident to occur. Eccentric (cantilever-type) loading on the anchor bolts caused them to fail from flexural bending. The bending occurred because an eccentricity (finite distance) existed between the location where the bolt was being pulled by the turnbuckle and the location where the ground and grout were supporting the bolt. Soft or loose ground near the surface did not provide adequate lateral support to the bolts. While the bolts were likely already overstressed prior to moving the feeder breaker from atop the tailpiece guarding, it is believed that the activity of tramming the feeder breaker off the tailpiece triggered the anchor bolt failures. A metallurgical evaluation by Matco Associates, Inc., determined that the bolt failures were likely the result of a bending overload, rather than hydrogen stress cracking (HSC). Contributing factors included a lack of task training on the safe work procedures for setting the feeder breaker and not maintaining the feeder breaker in safe operating condition.

Approved by:

Allyn C. Davis

Allyn C. Davis
District Manager

02-12-2009

Date

ENFORCEMENT ACTIONS

1. Order No. 7607359 was issued to San Juan Coal Company under the provision of Section 103(k) of the Mine Act to ensure the safety of the persons working around the East Mains No. 2 belt conveyor tailpiece until an investigation could be conducted and the area determined to be safe before resuming operations.

2. Citation No. 7607360 was issued to San Juan Coal Company under the provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 75.1722(c) on November 12, 2007. The citation states that the MMU (002-0), East Mains section down shift crew was in the process of setting the feeder breaker, company number 407, back onto the conveyor belt tailpiece when a serious accident occurred. The East Mains number 2 conveyor belt tailpiece in service was accidentally bumped by the feeder breaker while trying to reset it in position. This resulted in the conveyor tailpiece coming loose and contacting a miner positioned on the off walkway side of the conveyor belt. Repairs or maintenance shall not be performed on machinery until the power is off and the machinery is blocked against motion. This violation was terminated on November 16, 2007, after the mine operator implemented a new written standard operating procedure for setting the Stamler feeder breaker. The operator tasked trained the affected miners in removing power on the conveyor belt before setting the feeder breaker on the conveyor belt tailpiece. NOTE: this citation was issued before the accident resulted in the death of Mr. Hatathli on December 4, 2007. Normally, violations in fatal accident cases are not issued until the investigation is completed. This citation became a final order of the Federal Mine Safety and Health Review Commission on October 25, 2008, when the civil penalty was paid. The cited standard, 75.1722(c), is in error (a typographical error) and should have been 75.1725(c), but will not be changed or modified since the violation has become a final order of the Commission.

3. Citation No. 7607363 was issued to San Juan Coal Company under the provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 48.29(a) on November 12, 2007. The citation states that the operator's required training records reviewed on the surface were observed to be inadequate. The task training records provided for the miner that was operating the Stamler feeder breaker, company number 407 located in the East Mains section on November 12, 2007, was not provided on a MSHA form 5000-23 that the miner had received specified training. While operating the feeder breaker on this day a serious accident resulted. This citation was terminated on November 26, 2007, after the miner was retrained on the proper procedures for resetting the feeder breaker. NOTE: this citation was issued before the accident resulted in the death of Mr. Hatathli on December 4, 2007. Normally, violations in fatal accident cases are not issued until the investigation is completed. This citation became a final order of the Federal Mine Safety and Health Review Commission on October 25, 2008, when the civil penalty was paid. The cited standard, 48.29(a), is in error (a typographical error) and should have been 48.9(a),

but will not be changed or modified since the violation has become a final order of the Commission. In addition, a separate task training violation of 48.7(a) alleging that the miners involved in resetting the feeder breaker were not trained in safe work procedures for working on conveyor belts will not be issued as this is considered the same violation as Citation No. 7607363.

4. Safeguard No. 6684911 was issued to San Juan Coal Company under the provisions of Section 314(b) of the Mine Act in accordance with 30 CFR 75.1403. The anchorage for the East Mains No. 2 belt conveyor tailpiece was not properly designed, which contributed to a fatal accident. Eccentric (cantilever-type) loading on the anchor bolts caused them to fail from flexural bending. The bending occurred because there was an eccentricity (finite distance) between the location where the bolt was being pulled by the turnbuckle and the location where the ground and grout were adequately supporting the bolt. Soft or loose ground near the surface did not provide adequate lateral support to the bolts. This is a Notice to Provide Safeguard(s) requiring that all tailpiece anchorage systems at this mine shall be properly designed to hold the tailpiece in place and prevent anchorage failure.

5. Citation No. 6684912 was issued to San Juan Coal Company under the provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 75.1725(a). The Stamler feeder breaker, model BF-14B-2-5C, on the East Mains section was not maintained in safe operating condition. A fatal accident occurred while re-positioning this breaker onto the East Mains No. 2 belt conveyor tailpiece. Upon start-up and at different times during re-positioning, the crawler on the right side of the feeder breaker failed to respond to the operator during tramming operations. This condition contributed to the difficulty in positioning the feeder breaker onto the tailpiece requiring several attempts to be made. Witnesses reported that the feeder breaker was being moved off the tailpiece when the anchor bolts failed causing the accident to occur.

APPENDIX A

List of Persons Participating in the Investigation

SAN JUAN COAL COMPANY OFFICIALS

Steve Bessinger	Engineering Manager
David Hales	Health and Safety Superintendent
Charles Roybal	Senior Counsel, BHP Billiton
Jennifer Brown	Safety Specialist
Nigel Goff	Engineering Supervisor
John Paul LaBossiere	Shift Foreman
William K. Stevenson	Maintenance Foreman
Robert S. Beesley	Convenience Coordinator
Walter L. Burkett	Set-up Foreman
Kerry W. Hales	Longwall Coordinator
Jason J. Magelson	Set-up Foreman
Jeffrey K. Johnson	Section Foreman

SAN JUAN COAL COMPANY EMPLOYEES

Terrill K. Lee	Miner 1
Jacob T. Whitlock	Miner 1
James L. Chase	Miner 3
Russ Schultze	Underground Master Steward, International Union of Operating Engineers
Josh Ortega	JBI Coordinator, International Union of Operating Engineers

SHERMAN & HOWARD L.L.C.

Patrick J. Miller	Legal Counsel for San Juan Coal Co.

METCORR, METALLURGY AND CORROSION CONSULTING

Dr. Bruce Craig	Professional Engineer

MATCO ASSOCIATES, INC.

Jay Mahta	Senior Metallurgical Engineer

MINE SAFETY AND HEALTH ADMINISTRATION

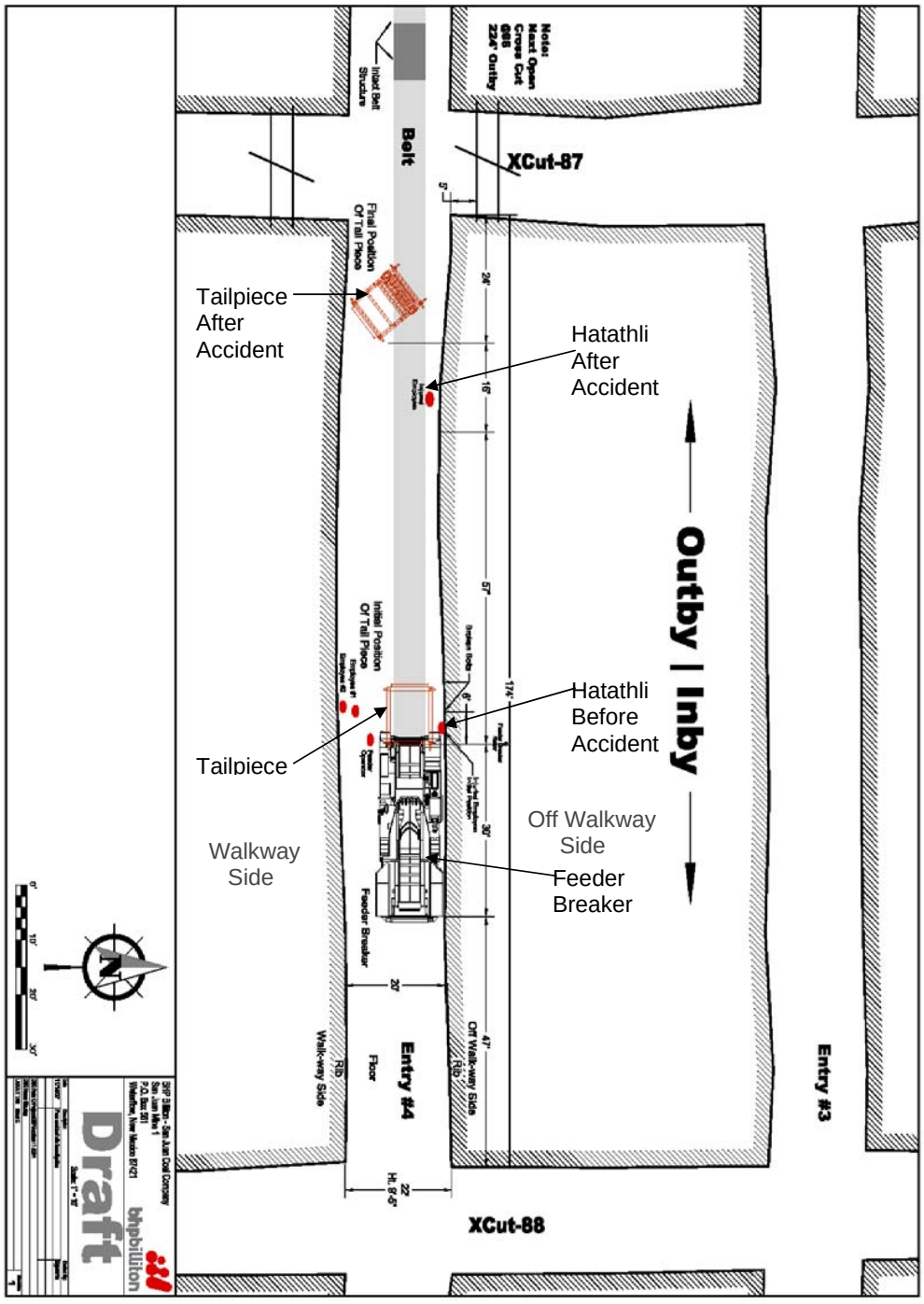
Larry W. Neil	Accident Investigator/Coal Mine Safety and Health Inspector
Terence M. Taylor	Senior Civil Engineer
Cord D. Cristando	Supervisory Coal Mine Safety and Health Inspector
Steve M. Powroznik	Training Specialist
William G. Denning	Staff Assistant to the District Manager

APPENDIX B

PICTURE OF ANCHOR BOLTS THAT PULLED OUT OF FLOOR
WITH THREE RECOVERED TURNBUCKLES

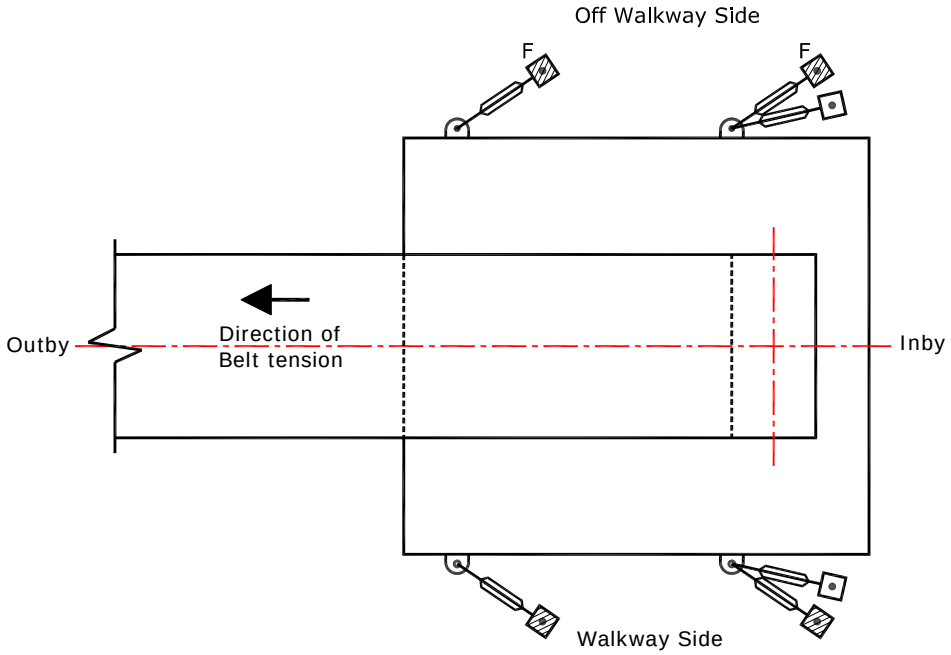
APPENDIX C

SKETCH OF ACCIDENT SCENE



APPENDIX D

Appendix D



Sketch of Tailpiece Anchorage

For Reference Only
(Not to scale)

Legend
Original Short Bolts
Additional Long Bolts
F Fractured Bolts

APPENDIX E

VICTIM INFORMATION

Accident Investigation Data - Victim Information
Event Number: 4 2 6 4 8 4 7

U.S. Department of Labor
Mine Safety and Health Administration

Victim Information: 1

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Degree of Injury:
Edison Hatathli	*M*	*50*	*01 Fatal*

5. Date(MM/DD/YY) and Time(24 Hr.) Of Death:	6. Date and Time Started:
a. Date: 12/04/2007 b.Time: 18:48	*a. Date: 11/12/2007 b.Time: 7:00*

7. Regular Job Title:	8. Work Activity when Injured:	9. Was this work activity part of regular job?
099 Miner 1 (experienced, qualified miner)	*041 Moving equipment*	Yes X No

10. Experience	Years	Weeks	Days
a. This Work Activity:	*6*	*14*	*0*
b. Regular Job Title:	*6*	*14*	*0*
c. This Mine:	*6*	*14*	*0*
d. Total Mining:	*6*	*14*	*0*

11. What Directly Inflicted Injury or Illness?	12. Nature of Injury or Illness:
038 Conveyor belt structure/tailpiece	*170 Crushing*

13. Training Deficiencies:
Hazard: | New/Newly-Employed Experienced Miner: | Annual: | Task: X

14. Company of Employment: (If different from production operator)
Operator
Independent Contractor ID: (if applicable)

15. On-site Emergency Medical Treatment:
Not Applicable: | First-Aid: | CPR: | EMT: X | Medical Professional: | None:

16. Part 50 Document Control Number: (form 7000-1) *220073180009*
17. Union Affiliation of Victim: *2501* *Int Union Operating Engineers*